REMARKS

The specification has been amended to correct the editorial errors at pages 3 and 4 of the specification.

The claims were rejected under 35 U.S.C. § 112.

Claims 10 and 13-15 were rejected under 35 U.S.C. § 112(2). The claims have been amended to define proper antecedent of clear and decedent basis in claims 10-13 have been amended in the manner believed to clearly and definitely positively set forth the various elements as subsequently referred to in the dependent claims, as well other editorial corrections would appear to be desirable upon review of the claims.

Claim 10 has been amended with the positive recitation for the "cavity" in line 5 by insertion of the "space" set forth in claim 4, lines 14-16. Similarly, claim 13 has been amended to establish antecedent basis for the "outlet passageway

'.

In reviewing of the claims, all of the claims applicant noted further what appear to be desirable editorial revisions to more positively set forth the respective elements. And further, in certain instances to even more clearly distinguish over the prior art as more fully discussed hereinafter.

The Examiner's careful attention to the claim and the prior art is sincerely appreciated. It is believed with the above revisions and for reasons as presently discussed, all of the claims clearly positively distinguish over the prior art including singly and in combination.

Claim rejections - 35 U.S.C. § 103.

Claims 3-4, 8, 9, 11 and claim 13 as amended stand rejected under 35 U.S.C. § 103 (a) as unpatentable over Dorsch et al. 4,936,744 (in view of Ozawa 5,224,821). Dorsch is cited for its disclosure of the pump impellar 26 which has a hub secured to the drive shaft 28. Reference is made to Fig. 4 to show the hub with the flat bottom wall and Fig. 3 to show the pump means 40 circumferentially spaced about the hub and extending radially outwardly from the bottom wall in combination. With reference again to Fig. 4 a shroud 100 is shown secured to upper and radially outer edge of the means 40 forming an entrance portion for the working fluid to enter the impellar and pass through the passageway between adjacent veins.

Flow openings 38 are located within the hub as noted by the Examiner and direct fluid to the back side of the hub vanes which are injected into an annular chamber 30 formed in a rear wall 32. Flow openings 38 are formed and provided for a different purpose and the reference specifically appear to block any significant flow into the area of the bearing structures. Thus the patent defines the system as having the opening 38 for providing for removing of gas or liquid rich gas which would pass through the opening 38 into the chamber beneath the vane or the impeller portion 36, as set forth at the bottom of column 4. Further, as noted at the top of column 5, the vanes 42 which are extending beneath the impellar hub 36 and extend from the central portion including the openings 38 immediately adjacent the hub supposedly function to act by centrifugal force to allow gas to collect adjacent shaft 28 and any liquid passing through the flow opening to be forced outwardly towards discharge opening 22 such as shown in Fig. 1. At column 5, beginning at line 5, the patent defines the interrelationship of the opening 38 and the gas or liquid gas filled passing through the opening for entrance into a vent chamber 60 which is located beneath the element 90 and the hub of the impellar and the outer casement as at 30 and 62. They specifically note that that structure "...provides a space for accumulating gas tending to collect rearwardly of impellar 26 and gas may be withdrawn from the vent chamber by a vent conduit 60 for delivery to a suitable gas collection reservoir, either directly or indirectly, via a gas removal system of the general type designated as 66 in Fig. 6." The vent conduit directs the gas and liquid from any bearing and/or seal. Fig. 4 shows a structure similar to Fig. 2 and Fig. 5 shows a similar structure with a bottom wall applied to the bottom vane portion to provide an even smaller opening 110 which "is used for ...facilitating escape of gas towards vent chamber 60." Apparently at this instance they are primarily solely concerned with accumulation of gas.

Thus it is respectfully submitted that this patent completely fails to remotely suggest any modification of a water pump impellar such as disclosed and claimed in the present application in claim 3 or any of the other claims depending therefrom.

Claim 3 depends from claim 1 and is believed to clearly and definitively distinguish from this patent in the defining of the diversion of a portion of the water from the edge of impeller and main flow passageway into and through said cavity and back to said flow passageway to positively cool the bearings/seal unit."

Claim (claim 3 lines 6-10). Clearly in the reference the diversion of water is solely for purposes of recovery of gas and the discharge of the gas to the exterior of the assembly and clearly and protected and spaced from the impellar and any bearing structure. Thus, the only illustration in the drawing is the impellar interconnected to the shaft 28 and with the shaft extending outwardly past the chamber 60 including the outlet passageway 62 into the shaft opening 30 in the rear wall of the chamber. (Column 4 lines 2-6). Thus, this reference especially constructed to minimize any inward flow to passageway 42.

Claim 3 based on claim 1 further distinguishes over the reference in that the hub structure terminates in spaced relation to the discharge opening. It then provides for an interconnecting shroud arrangement which is secured with an overlying outer wall 34 which has a slight overlap with the with the outer edge of hub 10 as shown in dotted line in Fig. 1 at 36. This thus defines a more open chamber and a passageway in the outwardly extending vein to permit water to flow into the chamber into arrangement with the seal in bearing assembly as shown in Fig. 1. Clearly, there is no manner in which the fluid or liquid would pass over the end of the member 36 and back into the passageway 42 of the reference. The whole teaching in the reference is to provide exactly the opposite flow, namely to move the water and gas outwardly and any gas which is trapped to allow exit through a separate and unique chamber 30 which is spaced from and specifically moves all liquid and/or gas away from the shaft and its support structure.

It is believed the above argument applies to all of the claims rejected, including all claims 3-4, 8-9, 11 and 13 as well as any other claim that depends from claim 3 and/or claim 4.

Claim 4 similarly defines a hub structure with the outer vane structure secured thereto. At lines 9-10 the pump vanes again are defined as "...extending radially outwardly from said bottom wall and including a vane portion beneath the hub." It also defines the shroud as "...extending outwardly from said hub with said adjacent vane defining flow passageway to the outlet passageway of the housing." Both structures define the vane structure as shown in the application and particularly in Fig. 1 where the hub has its outermost tip 24 spaced from the discharge opening. The shroud extends over the hub portion with the shroud 34 overlapping the outer end of the hub and then extending outwardly substantially from the hub and outwardly as well as to the outlet passageway

and substantially, with the lower vane portion provided for directing a portion of the water into the space between the bottom wall of the hub and the housing to direct water in the area of the seal and bearing unit.

Combining of the reference Ozawa with Dorsch, it is respectfully submitted again fails to provide any similar structure or teaching. Again, Ozawa has its pump impellar located as shown in Fig. 1 to extend clearly outwardly to the very discharge end and into the inlet or circumferential passageway 11. Also shown is opening 7. However, such openings again are very specially constructed to provide a flow which would appear to essentially avoid any interengagement or application with respect to the bearing structure.

Ozawa discloses holes which apparently provide a similar function in that any cooling water containing "bubbles" passes through the hole 23 and exhausted toward the impellar or front side of the impellar.

The Ozawa patent, however, teaches that its opening 7 are to be inclined especially in order to appropriately direct the bubbles from the water or with the water. Thus at column 3 the symmetrical annular holes 7 are described and in particular are described as "... inclined in the direction of rotation so as to make an angle with respect to a line normal to the rotation direction of the impellar 4.

The holes 7 in the impellar 4 serve for a transfer or exhaustion of bubbles there behind from a rearward side 8 to a frontward side 9 of the impellar 4." (Column 3 lines 6-15).

Ozawa further states that to assist in this action the system specifically and preferably include a guide 12 as shown in Fig. 5 and "...is set to be projected downstream of the hole the rotation direction of impellar 4 for enabling the easy introduction of bubbles in the cooling water." (Lines 17-21) and thereby promote the outward movement of the water and bubbles and any water therewith to be exhausted outwardly.

Fig. 6 is then described beginning at line 22 of column 3 to provide a different guide which projects the upstream of the holes "in the rotational direction of impellar 4 "...so as to reduce resistance against the cooling water upon exhaustion of the cooling water and bubbles." Thus, it clearly describes the formation of the system for purposes of directing of the water to the pumping portion 11 beginning at column 3 line 40. The bubbles are set to be transferred, with the cooling water, from the impellar 4 to the

pumping portion 11. At this time though, the most bubbles due to cavitation disappear, the remaining bubbles are at the rearward side 8 of the impellar 4. Resultant bubbles can be released or transferred to the front side 9 of the impellar 4 through holes 7.

In summary, as noted in the background of the Ozawa Patent 5,224,821, the whole purpose of the system is to carry out water and bubbles which may occur and in fact the background material disclosed is for purposes of avoiding any exhaust transfer of water into the bearing portion a bearing portion of a motor pump.

The purpose of the patent as set forth in the Summary of Invention notes that it is "...a water pump, a sufficient strength thereof and an effective transfer of bubbles from a rearward side to a frontward side thereof."

Further, in Ozawa the impellar hub extends outwardly from the center portion to the outlet passageway. It does not terminate in spaced relation thereto as in the present invention and the claims under consideration and clearly has absolutely no concept or any structure or teaching to provide for water passageway down around the bottom of the hub inwardly into engagement with the and for cooling of a bearing assembly of any kind.

In summary, it is believed that the claims clearly distinguish over the references singly and in combination.

Claim 2, 5-6, 12 and 15 stand rejected or the same combination of references above in view of Giberson 5,573,374. For reasons noted above any teaching of Giberson which shows a monolithic shroud impellar completely fails to provide the essential limitation set forth in the claims of this application. The reference shows a very unusual type of a shrouded impellar in which is a one-piece casting with the vanes created by CNC or profiling machining to form a passageway between vanes so that the vanes and hub are integrated or otherwise profiling such a machine and then welding of the shroud, vanes and hub together at the intersection of the vanes and shroud, etc. It is difficult to see how this reference can remotely suggest the structure of the present applicant as discussed above.

It is respectfully submitted that the claims 2, 5-6, 12 and 15 clearly distinguish over the combination of the three references structurally in the setting for the function and operation which is not remotely suggested by any of the three references.

Claim 7, which depends from claim 10 is believed, as amended, to stand further rejected over Dorsch et al. in view of Ozawa as applied to claim 4 in view of Freeman 4,891,876.

It is respectfully submitted that Freeman is completely devoid of any teaching when applied to the prior art references would result in the claim structure. It again has its hub member with the base portion 12 projected outwardly to terminate immediately adjacent to the outer most edge of the impellar arrangement and with the vanes 14 secured to the outer portion thereof. Combining of the reference with Dorsch and Ozawa still provides a vane structure which reaches the outlet passageway and does not and cannot function as the claimed structure.

The noted allowance of claim 14 is appreciated.

It is believed the claims, as revised, are clearly patentable over the prior art and such action is earnestly requested.

Counsel is available to discuss any questions or need for further clarification of the noted distinctions over the prior art.

Respectfully submitted,

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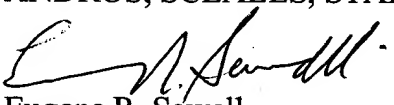

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Serial No. 09/585,163

IN THE SPECIFICATION:

Paragraph beginning at line 7 of page 3 has been amended as follows:

The impeller of the present invention is readily injection molded with well known injection molding equipment and with conventional plastics presently used in coolant pump impellers. The impeller of the present invention produces a highly cost-effective structure with both manufacturing and assembly costs, as well as an improved and long life ~~assembly~~ pump assembly.

Paragraph beginning at line 11 of page 3 has been amended as follows:

Each vane 17 ~~extended~~ extends axially and circumferentially ~~of the impeller~~ from the hub. Each vane 17 is a shaped blade member having the inner end portion 18 secured to the hub 15, and extending radially and circumferentially from the hub to an outer axial end edge. The adjacent vanes 17 ~~extends~~ extend from the hub 15 and form with the base 3 and shroud 16, a flow passageway 20 to outlet passageway 13. The top edge 19 of each vane is connected to the corresponding edges 19 of all other vanes 17 by the shroud 16, which is inclined to direct the water to flow downwardly and peripherally into passageways 20, 13 and outlet opening 14.

IN THE CLAIMS:

Claims 1, 4, 9-10 and 13-14 have been amended as follows:

1. (amended) A water pump impeller for a cooling water pump unit including a housing defining a water chamber having a water inlet and a water outlet and having an

impeller shaft in a seal/bearing unit mounted within the housing and configured to receive the water pump impeller connected to said impeller shaft within said water chamber, the improvement wherein said water pump impeller comprises a hub configured and constructed to be secured to said drive shaft and located within said water chamber, said hub having an outer peripheral wall extending from an innermost end of the hub axially and radially to a substantially flat bottom wall with the outer end of the hub spaced substantially from said water outlet;

a plurality of circumferentially spaced pump vanes secured in circumferentially spaced relation to the outer peripheral wall of said hub and extending outwardly of said hub into close spaced relation to said water outlet, each said pump vane extending radially outwardly from said bottom wall; and

a shroud secured to the upper and radially ~~outer~~ outlet edges of said vane extending outwardly beyond said hub into close spaced relation with said water outlet with said adjacent vanes defining flow passageways to the ~~outer~~ outlet passageway of the housing wall adjacent said bottom wall, said shroud having a radially inner end portion overlying a radially outer portion of said hub to form an entrance portion of said flow passageway.

4. (amended) A water pump impeller for a cooling water pump unit having a cooling chamber defined by a housing and having a drive shaft rotatably mounted to said housing and projecting into said chamber, said housing having water inlet to said chamber and an ~~outer passage~~ outlet passageway from said chamber, said water pump impeller comprising a hub configured and constructed to be secured to said shaft within said chamber, said hub having an outer peripheral wall extending from an innermost portion of the hub axially and radially to a substantially flat bottom wall, a plurality of circumferentially spaced pump vanes secured in circumferentially spaced relation to the outer peripheral wall of said hub and extending outwardly of said hub, said pump vanes extending radially outwardly from said bottom wall and including a vane portion beneath the hub, and a shroud secured to the upper edges of said vane in spaced relation to said shaft and extending outwardly from said

with said adjacent vane defining flow passageways to the ~~outer~~ outlet passageway of the housing, said hub and vanes being constructed and configured to direct a portion of the water in said flow passageways into the space between said bottom wall of the hub and the housing wall adjacent said bottom wall to direct water into engagement with the seal/bearing unit.

9. (amended) The water pump impeller of claim 4 wherein said housing includes an encircling side wall for enclosing the outer radial portions of said impeller, said outlet passageway of said housing ~~further~~ constructed and configured ~~with~~ as a circumferential water passageway terminating in an outlet immediately adjacent to the peripheral portion of said impeller for movement of water from the housing into said ~~outer~~ circumferential water passageway of the housing.

10. (amended) The water pump impeller of claim 4 wherein the radially outer wall of said hub has a radially inner relatively constant diameter portion connected by a concave radial planar portion to a bottom edge portion, said bottom edge portion having a reverse convex curvature terminating in a flat bottom wall of said hub, said construction promoting the flow of a portion of the water in the flow passageway into said ~~cavity~~ spaced between said bottom wall of the hub and the adjacent housing wall.

13. (amended) In combination, a cooling housing configured and constructed for interconnection to an internal combustion engine having a water inlet and a water outlet for connection to the engine cooling system, said water outlet being connected to a circumferential outlet passageway adjacent an outer wall of said housing, said housing having a cover having an open end and a base,

said base having a base wall with a shaft opening, said base being secured to the

open end of said cover to close said chamber, ~~the~~ a shaft rotatably mounted within said shaft opening, said base wall and including an outer exposed drive shaft connection and an inner shaft portion, said ~~base having an inner~~ base wall ~~with~~ having an encircling cavity about said shaft opening, a bearing and seal unit mounted within said shaft opening and projecting inwardly of said base within said cavity,

an impeller secured to the end of said shaft within said housing, said impeller having a hub secured to said shaft, said hub having a substantially concave circumferential surface, a plurality of circumferentially spaced and like vanes secured to said hub and having a radially inner portion connected to said concave circumferential surface and extending radially outwardly and circumferentially therefrom, each of said vanes projecting axially downwardly beneath said bottom wall of said hub and having an inner portion terminating in close spaced relation to said cavity, said vanes terminating in spaced relation to said outlet passageway, a shroud connected to the top outer edges of said vanes and defining circumferentially spaced flow passageways from said chamber to said circumferential outlet passageway whereby rotation of said impeller draws water through said cover and discharges the same into said outlet passageway with a portion of the water flow being directed by said vanes and said hub about the outer edge of said hub and into and through said cavity and thereby cooling of said bearing and seal unit.

14. (amended) The combination of claim 13 wherein the radially outer edge of said hub is a substantially convex wall terminating in the bottom wall of said hub, said bottom wall being a substantially planar radial wall, the base having a flat upper wall opposing said hub bottom wall, said cavity being formed in said ~~base~~ flat upper wall and including a radial portion immediately adjacent said seal/